

CLAIMS

What is Claimed is:

1. A method for the production of a substrate with a magnetron sputter coated substrate, wherein:
 - at a magnetron source with a sputter surface, a magnetron-magnetic field pattern is cyclically moved along the said sputter surface,
 - the substrate is distanced from, and is moved above, the sputter surface,
 - therein characterized, in that the quantity of material deposited on the substrate per time unit is cyclically changed during the phase locked, cyclic movement of the magnetic field pattern.
2. A method in accord with claim 1, therein characterized, in that the cyclic movement of the magnetic field pattern is carried out in two dimensions advantageously by means of a pendular or circumferential movement relative to an axis perpendicular to the said sputter surface.
3. A method in accord with claim 1 or 2, therein characterized, in that the deposited quantity of material is simultaneously cyclically changed over the entire expanse of the sputter surface.
4. A method in accord with one of the claims 1 to 3, therein characterized, in that the deposited quantity of material is changed by means of a change of reactive gas flow in the space between the sputter surface and the substrate.
5. A method in accord with one of the claims 1 to 4, therein characterized, in that the deposited quantity of material is changed by an alteration of the operational gas flow in the space between the sputter surface and the substrate.
6. A method in accord with claim 3, therein characterized, in that the deposited quantity of material is changed by means of an alteration of the sputter loading.

7. A method in accord with one of the claims 1 to 6, therein characterized, in that the phase locked cyclical change of the quantity of material is undertaken with a time-based procedure, the frequency spectrum of which possesses a dominate spectral line with a doubled frequency in relation to the frequency of the cyclic movement of the magnetic field.
8. A method in accord with claim 7, therein characterized, in that the said procedure has an additional dominate frequency line in the case of the frequency of the cyclic characteristics of the magnetic field movement.
9. A method in accord with one of the claims 1 to 8, therein characterized, in that the magnetron magnetic field pattern is designed to be mirror symmetric to an axis in a plane, which is parallel to the sputter surface, or is mirror symmetric to two axes mutually perpendicular to one another and which axes lie in the said plane.
10. A method in accord with one of the claims 1 to 9, therein characterized, in that in the process space between the sputter surface and the substrate, a reactive gas is provided.
11. A method in accord with one of the claims 1 to 10, therein characterized, in that a circularly shaped sputter surface is used.
12. A method in accord with one of the claims 1 to 11, therein characterized, in that the sputter surface is formed by the material of a target body.
13. A method in accord with one of the claims 1 to 12, therein characterized, in that between the sputter surface and the substrate, no components which affect the material flow apportionment are provided.
14. A method in accord with one of the claims 1 to 13, therein characterized, in that the procedural course of the phase-locked cyclical change is selected to be dependent

upon the relative movement between the substrate and the sputter surface and/or dependent upon the cyclic magnetic field pattern movement.

15. A method in accord with one of the claims 1 to 14, therein characterized, in that the course of the phase locked cyclic change, alters itself over time.
16. A method in accord with one of the claims 1 to 15, therein characterized, in that the apportionment of immediately laid quantity of material on the substrate is first considered as a evaluated control value, second, the said value is compared with a specified standard quantity and in accord with the comparison, is employed as a controlling variable, adjusting the characteristics of the phase locked cyclical change of the specified value in a circuit for the mentioned apportionment.
17. A method in accord with one of the claims 1 to 16, therein characterized, in that the substrate is moved over the sputter surface a plurality of times.
18. A method in accord with one of the claims 1 to 17, therein characterized, in that the substrate is moved back and forth over the sputter surface.
19. A method in accord with one of the claims 1 to 18, therein characterized, in that the substrate aligned planarly parallel above the substrate, is moved linearly.
20. A method in accord with claim 19, therein characterized, in that the substrate is moved in a plane parallel to the sputter surface.
21. A method in accord with claim 20, therein characterized, in that the substrate, aligned planarly parallel with the substrate, is moved in a non-linear manner, preferably along a circular path.
22. A method in accord with one of the claims 1 to 18, therein characterized, in that the substrate, aligned planarly parallel to the sputter surface, is moved advantageously

in a non-linear manner, preferably along a circular path with a point of rotation outside of the sputter surface.

23. A method in accord with one of the claims 1 to 21, therein characterized, in that an additional change in the material quantity deposited per unit time is superimposed on a previous change thereof, which is synchronized with the substrate motion.
24. A method in accord with one of the claims 1 to 23, therein characterized, in that optimized homogenous layer thickness apportionment on magnetron sputter coated substrates and/or a stoichiometric apportionment thereon are produced.
25. A method in accord with one of the claims 1 to 24, therein characterized, in that magnetron sputter coated, planar substrates are produced.
26. A method in accord with one of the claims 1 to 25, therein characterized, in that the produced substrate possesses a layer thickness deviation relative to an average layer thickness value, which, relative to a 1000 cm^2 substrate surface, which does not exceed a maximum of 1 %.
27. A method in accord with one of the claims 1 to 23, therein characterized, in that the produced substrate possesses a layer thickness deviation of the locally deposited quantity of sputter material which, relative to an averaged value, which, for a 10 cm^2 substrate surface, does not exceed a maximum of 0.01 %.
28. Magnetron sputter coating equipment with:
 - a magnetron source and a cyclically driven magnetic arrangement located underneath a sputter target in a plane parallel to a sputter surface of the said sputter target, and
 - a substrate transport apparatus, by means of which a substrate is moved over the sputter surface,

therein characterized, in that a modulation arrangement for the quantity of material sputtered away from the source per time unit is available, which, phase locked with the cyclic magnetic arrangement movement, produces a cyclic modulation.

29. Equipment in accord with claim 28, therein characterized, in that the magnet arrangement with an active pendulous rotational or circumferential drive actively bound to a pendulous rotational or circumferential motion to achieve a pendulous rotation or a circumferential movement relative to an axis perpendicular to the sputter surface of the target.
30. Equipment in accord with one of the claims 28 or 29, therein characterized, in that the modulation arrangement of the quantity of material sputtered away from the from the source per time unit is modulated simultaneously over the entire sputter surface.
31. Equipment in accord with one of the claims 28 to 30, therein characterized, in that the modulation arrangement encompasses a reactive gas flow and/or an operational gas flow adjustment apparatus.
32. Equipment in accord with one of the claims 28 to 31, therein characterized, in that the modulation arrangement includes the electrical feed to the sputter target.
33. Equipment in accord with one of the claims 28 to 32, therein characterized, in that the magnet arrangement is mirror symmetrically shaped and aligned relative to an axis parallel to the sputter surface or relative to two axes which are parallel to the sputter surface and perpendicular to one another.
34. Equipment in accord with one of the claims 28 to 33, therein characterized, in that in the area of the magnetron source a gas inlet combined with a reactive gas supply exists.

35. Equipment in accord with one of the claims 28 to 34, therein characterized, in that the magnetron source has a circular shaped target.
36. Equipment in accord with one of the claims 28 to 35, therein characterized, in that the target is constructed from a single material.
37. Equipment in accord with one of the claims 28 to 36, therein characterized, in that, between the sputter surface and the substrate transport apparatus, no component is installed, which impairs the direct sight-line between the said sputter surface and transport apparatus.
38. Equipment in accord with one of the claims 28 to 37, therein characterized, in that an evaluation device determining the local apportionment of the sputtered-off materials on a substrate on the transport apparatus exists, the output of which device is actively connected to the input of a comparator unit, the second entry thereof is actively connected to a data source of specified value of apportionment, and the output thereof possesses a controlling entry to the adjustment unit for the modulation apparatus.
39. Equipment in accord with one of the claims 28 to 38, therein characterized, in that the transport apparatus is actively bound with a drive, which, at least, moves a substrate carrier cyclically past the sputter surface.